

DRINKING WATER SURVEILLANCE PROGRAM

**STOUFFVILLE
WELL SUPPLY**

ANNUAL REPORT 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

STOUFFVILLE WELL SUPPLY 1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Stouffville well supply consists of a number of groundwater wells. Wells 5 and 6 feed two interconnected reservoirs from which water is pumped to the distribution system and the water tower. The only treatment provided is disinfection. This system has a rated capacity of $5.4 \times 1000 \text{ m}^3/\text{day}$. The Stouffville well supply serves a population of approximately 6,700.

Raw water from both wells and treated water leaving the reservoir was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Stouffville well supply, as sampled by DWSP, for the sample year 1990, produced good quality water. Water from the distribution system was not sampled.

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A ' ' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW 5			RAW 6			TREATED		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	18	0	0	18	3	16	6	0	0
CHEMISTRY (FLD)	1	1	100	1	1	100	18	18	100
CHEMISTRY (LAB)	132	84	63	132	89	67	132	82	62
METALS	144	40	27	144	43	29	144	45	31
CHLOROAROMATICS	84	0	0	70	0	0	70	0	0
CHLOROPHENOLS	12	0	0	12	0	0	12	0	0
PAH	99	0	0	99	0	0	82	0	0
PESTICIDES & PCB	206	0	0	185	0	0	185	0	0
PHENOLICS	6	0	0	6	0	0	6	0	0
SPECIFIC PESTICIDES	58	0	0	57	0	0	57	0	0
VOLATILES	116	0	0	174	0	0	145	20	13
TOTAL	876	125		898	136		857	165	

DRINKING WATER SURVEILLANCE PROGRAM

STOUFFVILLE WELL SUPPLY 1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Stouffville well supply in the spring of 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The Stouffville well Supply consists of a number of groundwater wells. Wells 5 and 6 feed two interconnected reservoirs from which water is pumped to the distribution system and the water tower. The only treatment provided is disinfection. This system has a rated capacity of $5.4 \times 1000 \text{ m}^3/\text{day}$. The Stouffville well supply serves a population of approximately 6,700.

The sample day flows ranged from $1.386 \times 1000 \text{ m}^3/\text{day}$ to $2.456 \times 1000 \text{ m}^3/\text{day}$.

General plant information is presented in Table 1.

SAMPLING AND ANALYSES

Sample lines at the wells and reservoir were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since

the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Raw water at two wells and treated water leaving the reservoir was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- RESULTS FROM RAW AND DISTRIBUTED WATERS;
- THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES;
- POSITIVE ORGANIC PARAMETERS DETECTED; AS WELL AS
- PERSISTENT TRACES OF ORGANIC PARAMETERS IN THE RAW WATER.

In this report comments are combined for all sample locations for each parameter discussed. The water in the distribution system can be a mixture from many sources. Due to the many wells supplying this water system and the relatively few sample locations on DWSP, this report does not provide a complete picture of the drinking water quality.

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated water. No results were reported above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (LAB)

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the European Economic Community Aesthetic Guideline Level of 400 umho/cm in the 6 treated water samples with a maximum reported value of 570.0 umho/cm.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in all 6 treated water samples with a maximum reported value of 304.0 mg/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results exceeded the guideline.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that parathion was detected at trace levels in one treated water and raw well

sample. Both locations were resampled and parathion was not detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in 5 treated water samples with a maximum level of 22.30 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Stouffville well supply, as sampled by DWSP, for the sample year 1990, produced good quality water. Water from the distribution system was not sampled.

No known health related guidelines were exceeded.

TABLE 1
DRINKING WATER SURVEILLANCE PROGRAM
PLANT GENERAL REPORT

WORKS #: 220002333
PLANT NAME: STOUFFVILLE WELL SUPPLY

DISTRICT: TORONTO
REGION: CENTRAL
DISTRICT OFFICER : D. BEACH

UTM #: 176383004872700

PLANT SUPERINTENDENT:

ADDRESS: REGIONAL MUNIC.OF YORK
BOX 296, NEWMARKET, ONTARIO
L3Y 4X1
(416 895 2303)

MUNICIPALITY: WHITCHURCH-STOUFFVILLE
AUTHORITY: MUNICIPAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	-	(X 1000 M3/DAY)
RATED CAPACITY:	-	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
-----	-----
TOWN OF STOUFFVILLE	6,700

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY SAMPLE DAY CONDITIONS FOR 1990

TREATMENT CHEMICAL DOSAGE (MG/L)
POST CHLORINATION

CHLORINE

DATE	DELAY * TIME(HRS)	FLOW (1000M3)	
FEB 20	9.00	1.423	.98
APR 19	.00	.000	1.00
JUN 19	.00	2.456	.87
OCT 16	24.00	2.099	.97
DEC 18	24.00	1.861	1.12

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW 5			RAW 6			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
<hr/>									
BACTERIOLOGICAL									
FECAL COLIFORM MF	6	0	0	6	0	0	.	.	.
STANDRD PLATE CNT MF	.	.	.	.	.	.	6	0	0
TOTAL COLIFORM MF	6	0	0	6	0	0	.	.	.
T COLIFORM BCKGRD MF	6	0	0	6	3	0	.	.	.
*TOTAL SCAN BACTERIOLOGICAL	18	0	0	18	3	0	6	0	0
<hr/>									
CHEMISTRY (FLD)									
FLD CHLORINE (COMB)	.	.	.	.	.	.	5	5	0
FLD CHLORINE FREE	.	.	.	.	.	.	5	5	0
FLD CHLORINE (TOTAL)	.	.	.	.	.	.	5	5	0
FLD TEMPERATURE	1	1	0	1	1	0	3	3	0
*TOTAL SCAN CHEMISTRY (FLD)	1	1	0	1	1	0	18	18	0
<hr/>									
CHEMISTRY (LAB)									
ALKALINITY	6	6	0	6	6	0	6	6	0
CALCIUM	6	6	0	6	6	0	6	6	0
CYANIDE	6	0	1	6	0	0	6	0	1
CHLORIDE	6	6	0	6	6	0	6	6	0
COLOUR	6	0	3	6	0	6	6	0	2
CONDUCTIVITY	6	6	0	6	6	0	6	6	0
DISS ORG CARBON	6	5	1	6	6	0	6	5	1
FLUORIDE	6	1	5	6	2	4	6	1	5
HARDNESS	6	6	0	6	6	0	6	6	0
IONCAL	6	6	0	6	6	0	6	6	0
LANGELIERS INDEX	6	6	0	6	6	0	6	6	0
MAGNESIUM	6	6	0	6	6	0	6	6	0
SODIUM	6	6	0	6	6	0	6	6	0
AMMONIUM TOTAL	6	0	1	6	0	1	6	0	0
NITRITE	6	1	3	6	1	4	6	0	2
TOTAL NITRATES	6	6	0	6	6	0	6	6	0
NITROGEN TOT KJELD	6	2	4	6	3	3	6	1	5
PH	6	6	0	6	6	0	6	6	0
PHOSPHORUS FIL REACT	6	0	4	6	0	4	6	0	6
PHOSPHORUS TOTAL	6	0	2	6	0	2	6	0	4
SULPHATE	6	6	0	6	6	0	6	6	0
TURBIDITY	6	3	3	6	5	1	6	3	3
*TOTAL SCAN CHEMISTRY (LAB)	132	84	27	132	89	25	132	82	29
<hr/>									

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW 5			RAW 6			TREATED		
	TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE		

METALS									
SILVER	6	0	0	6	0	0	6	0	1
ALUMINUM	6	6	0	6	6	0	6	6	0
ARSENIC	6	0	6	6	0	4	6	0	5
BARIUM	6	6	0	6	6	0	6	6	0
BORON	6	4	2	6	4	2	6	4	2
BERYLLIUM	6	0	2	6	0	3	6	0	1
CADMIUM	6	0	2	6	0	0	6	0	0
COBALT	6	0	3	6	0	3	6	0	3
CHROMIUM	6	2	4	6	1	5	6	2	4
COPPER	6	1	3	6	0	6	6	1	5
IRON	6	0	0	6	0	0	6	0	0
MERCURY	6	0	0	6	0	0	6	0	1
MANGANESE	6	0	5	6	0	6	6	0	5
MOLYBDENUM	6	0	6	6	6	0	6	4	2
NICKEL	6	0	2	6	0	1	6	0	1
LEAD	6	0	1	6	0	2	6	0	2
ANTIMONY	6	1	5	6	0	6	6	0	6
SELENIUM	6	0	0	6	0	0	6	0	1
STRONTIUM	6	6	0	6	6	0	6	6	0
TITANIUM	6	6	0	6	6	0	6	6	0
THALLIUM	6	0	0	6	0	0	6	0	0
URANIUM	6	6	0	6	6	0	6	6	0
VANADIUM	6	0	6	6	0	5	6	0	5
ZINC	6	2	4	6	2	4	6	4	2

*TOTAL SCAN METALS	144	40	51	144	43	47	144	45	46
*TOTAL GROUP INORGANIC & PHYSICAL	277	125	78	277	133	72	294	145	75

CHLOROAROMATICS									
HEXACHLOROBUTADIENE	6	0	0	5	0	0	5	0	0
123 TRICHLOROBENZENE	6	0	0	5	0	0	5	0	0
1234 T-CHLOROBENZENE	6	0	0	5	0	0	5	0	0
1235 T-CHLOROBENZENE	6	0	0	5	0	0	5	0	0
124 TRICHLOROBENZENE	6	0	0	5	0	0	5	0	0
1245 T-CHLOROBENZENE	6	0	0	5	0	0	5	0	0
135 TRICHLOROBENZENE	6	0	0	5	0	0	5	0	0
HCB	6	0	0	5	0	0	5	0	0
HEXACHLOROETHANE	6	0	0	5	0	0	5	0	0
OCTACHLOROSTYRENE	6	0	0	5	0	0	5	0	0
PENTACHLOROBENZENE	6	0	0	5	0	0	5	0	0
236 TRICHLOROTOLUENE	6	0	0	5	0	0	5	0	0
245 TRICHLOROTOLUENE	6	0	0	5	0	0	5	0	0
26A TRICHLOROTOLUENE	6	0	0	5	0	0	5	0	0

*TOTAL SCAN CHLOROAROMATICS	84	0	0	70	0	0	70	0	0

CHLOROPHENOLS									
234 TRICHLOROPHENOL	2	0	0	2	0	0	2	0	0
2345 T-CHLOROPHENOL	2	0	0	2	0	0	2	0	0
2356 T-CHLOROPHENOL	2	0	0	2	0	0	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW 5			RAW 6			TREATED		
	TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE		
245-TRICHLOROPHENOL	2	0	0	2	0	0	2	0	0
246-TRICHLOROPHENOL	2	0	0	2	0	0	2	0	0
PENTACHLOROPHENOL	2	0	0	2	0	0	2	0	0
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	12	0	0

PAH									
PHENANTHRENE	6	0	0	6	0	0	5	0	0
ANTHRACENE	5	0	0	5	0	0	4	0	0
FLUORANTHENE	6	0	0	6	0	0	5	0	0
PYRENE	6	0	0	6	0	0	5	0	0
BENZO(A)ANTHRACENE	6	0	0	6	0	0	5	0	0
CHRYSENE	6	0	0	6	0	0	5	0	0
DIMETH. BENZ(A)ANTHR	5	0	0	5	0	0	4	0	0
BENZO(E) PYRENE	6	0	0	6	0	0	5	0	0
BENZO(B) FLUORANTHEN	6	0	0	6	0	0	5	0	0
PERYLENE	6	0	0	6	0	0	5	0	0
BENZO(K) FLUORANTHEN	6	0	0	6	0	0	5	0	0
BENZO(A) PYRENE	5	0	0	5	0	0	4	0	0
BENZO(G,H,I) PERYLEN	6	0	0	6	0	0	5	0	0
DIBENZO(A,H) ANTHRAC	6	0	0	6	0	0	5	0	0
INDENO(1,2,3-C,D) PY	6	0	0	6	0	0	5	0	0
BENZO(B) CHRYSENE	6	0	0	6	0	0	5	0	0
CORONENE	6	0	0	6	0	0	5	0	0
*TOTAL SCAN PAH	99	0	0	99	0	0	82	0	0

PESTICIDES & PCB									
ALDRIN	6	0	0	5	0	0	5	0	0
ALPHA BHC	6	0	0	5	0	0	5	0	0
BETA BHC	6	0	0	5	0	0	5	0	0
LINDANE	6	0	0	5	0	0	5	0	0
ALPHA CHLORDANE	6	0	0	5	0	0	5	0	0
GAMMA CHLORDANE	6	0	0	5	0	0	5	0	0
DIELDRIN	6	0	0	5	0	0	5	0	0
METHOXYCHLOR	6	0	0	5	0	0	5	0	0
ENDOSULFAN I	6	0	0	5	0	0	5	0	0
ENDOSULFAN II	6	0	0	5	0	0	5	0	0
ENDRIN	6	0	0	5	0	0	5	0	0
ENDOSULFAN SULPHATE	6	0	0	5	0	0	5	0	0
HEPTACHLOR EPOXIDE	6	0	0	5	0	0	5	0	0
HEPTACHLOR	6	0	0	5	0	0	5	0	0
MIREX	6	0	0	5	0	0	5	0	0
OXYCHLORDANE	6	0	0	5	0	0	5	0	0
OPDDT	6	0	0	5	0	0	5	0	0
PCB	6	0	0	5	0	0	5	0	0
DDD	6	0	0	5	0	0	5	0	0
PPDDE	6	0	0	5	0	0	5	0	0
PPDDT	6	0	0	5	0	0	5	0	0
AMETRINE	6	0	0	6	0	0	6	0	0
ATRAZINE	6	0	0	6	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW 5			RAW 6			TREATED		
	TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE		
ATRATONE	6	0	0	6	0	0	6	0	0
CYANAZINE (BLADEX)	6	0	0	6	0	0	6	0	0
DESETHYLATRAZINE	6	0	0	6	0	0	6	0	0
D-ETHYL SIMAZINE	6	0	0	6	0	0	6	0	0
PROMETONE	6	0	0	6	0	0	6	0	0
PROPAZINE	6	0	0	6	0	0	6	0	0
PROMETRYNE	6	0	0	6	0	0	6	0	0
METRIBUZIN (SENCOR)	6	0	0	6	0	0	6	0	0
SIMAZINE	6	0	0	6	0	0	6	0	0
ALACHLOR (LASSO)	6	0	0	6	0	0	6	0	0
METOLACHLOR	6	0	0	6	0	0	6	0	0
HEXACHLOROCYCLOPENTADIEN	2	0	0	2	0	0	2	0	0
*TOTAL SCAN PESTICIDES & PCB	206	0	0	185	0	0	185	0	0

PHENOLICS									
PHENOLICS	6	0	4	6	0	3	6	0	2
*TOTAL SCAN PHENOLICS	6	0	4	6	0	3	6	0	2

SPECIFIC PESTICIDES									
TOXAPHENE	6	0	0	5	0	0	5	0	0
2,4,5-T	2	0	0	2	0	0	2	0	0
2,4-D	2	0	0	2	0	0	2	0	0
2,4-DB	2	0	0	2	0	0	2	0	0
2,4 D PROPIONIC ACID	2	0	0	2	0	0	2	0	0
DICAMBA	2	0	0	2	0	0	2	0	0
PICHLORAM	1	0	0	1	0	0	1	0	0
SILVEX	2	0	0	2	0	0	2	0	0
DIAZINON	2	0	0	2	0	0	2	0	0
DICHLOROVOS	2	0	0	2	0	0	2	0	0
CHLORPYRIFOS	2	0	0	2	0	0	2	0	0
ETHION	2	0	0	2	0	0	2	0	0
AZINPHOS-METHYL	0	0	0	0	0	0	0	0	0
MALATHION	2	0	0	2	0	0	2	0	0
MEVINPHOS	2	0	0	2	0	0	2	0	0
METHYL PARATHION	2	0	0	2	0	0	2	0	0
METHYLTRITHION	2	0	0	2	0	0	2	0	0
PARATHION	2	0	0	2	0	1	2	0	1
PHORATE	1	0	0	1	0	0	1	0	0
RELDAN	2	0	0	2	0	0	2	0	0
RONNEL	2	0	0	2	0	0	2	0	0
AMINOCARB	0	0	0	0	0	0	0	0	0
BENONYL	0	0	0	0	0	0	0	0	0
BUX	0	0	0	0	0	0	0	0	0
CARBOFURAN	2	0	0	2	0	0	2	0	0
CICP	2	0	0	2	0	0	2	0	0
DIALATE	2	0	0	2	0	0	2	0	0
EPTAM	2	0	0	2	0	0	2	0	0
IPC	2	0	0	2	0	0	2	0	0
PROPOXUR	2	0	0	2	0	0	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW 5			RAW 6			TREATED		
	TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE		
CARBARYL	2	0	0	2	0	0	2	0	0
BUTYLATE	2	0	0	2	0	0	2	0	0
*TOTAL SCAN SPECIFIC PESTICIDES	58	0	0	57	0	1	57	0	1

VOLATILES									
BENZENE	4	0	0	6	0	1	5	0	0
TOLUENE	4	0	0	6	0	0	5	0	0
ETHYLBENZENE	4	0	2	6	0	3	5	0	1
P-XYLENE	4	0	0	6	0	0	5	0	0
M-XYLENE	4	0	0	6	0	0	5	0	0
O-XYLENE	4	0	0	6	0	0	5	0	0
STYRENE	4	0	3	6	0	5	5	0	0
1,1 DICHLOROETHYLENE	4	0	0	6	0	0	5	0	0
METHYLENE CHLORIDE	4	0	0	6	0	0	5	0	0
1,1,2 DICHLOROETHYLENE	4	0	0	6	0	0	5	0	0
1,1 DICHLOROETHANE	4	0	0	6	0	0	5	0	0
CHLOROFORM	4	0	0	6	0	0	5	5	0
111, TRICHLOROETHANE	4	0	0	6	0	0	5	0	0
1,2 DICHLOROETHANE	4	0	0	6	0	0	5	0	0
CARBON TETRACHLORIDE	4	0	0	6	0	0	5	0	0
1,2 DICHLOROPROPANE	4	0	0	6	0	0	5	0	0
TRICHLOROETHYLENE	4	0	0	6	0	0	5	0	0
DICHLOROBROMOMETHANE	4	0	0	6	0	0	5	5	0
112 TRICHLOROETHANE	4	0	0	6	0	0	5	0	0
CHLORODIBROMOMETHANE	4	0	0	6	0	0	5	5	0
T-CHLOROETHYLENE	4	0	0	6	0	0	5	0	0
BROMOFORM	4	0	0	6	0	0	5	0	5
1122 T-CHLOROETHANE	4	0	0	6	0	0	5	0	0
CHLOROBENZENE	4	0	0	6	0	0	5	0	0
1,4 DICHLOROBENZENE	4	0	0	6	0	0	5	0	0
1,3 DICHLOROBENZENE	4	0	0	6	0	0	5	0	0
1,2 DICHLOROBENZENE	4	0	0	6	0	0	5	0	0
ETHYLENE DIBROMIDE	4	0	0	6	0	0	5	0	0
TOTL TRIHALOMETHANES	4	0	0	6	0	0	5	5	0
*TOTAL SCAN VOLATILES	116	0	5	174	0	9	145	20	6
*TOTAL GROUP ORGANIC	581	0	9	603	0	13	557	20	9

KEY TO TABLE 5 and 6

- A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3+. AO for Total Xylenes
4. Recommended Operational Guideline
- B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)
- C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV
- D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH
- F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissible Concentration (MADC)
- G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE
- I NEW YORK STATE AMBIENT WATER GUIDELINE
- N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminate Interference
XP	Positive After X Number Of Hours
T#	(T06) Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

BACTERIOLOGICAL				DET'N LIMIT = 0	GUIDELINE = 0 (A1)
FECAL COLIFORM MF (CT/100ML)					
FEB	BDL	BDL	.	.	.
APR	0	0	.	.	.
JUN	0	0	.	.	.
AUG	0	0	.	.	.
OCT	0	0	.	.	.
DEC	0	0	.	.	.

STANDRD PLATE CNT MF (COUNT/ML)				DET'N LIMIT = 0	GUIDELINE = 500/ML (A3)
FEB	.	.	0 <=>	.	.
APR	.	.	0 <=>	.	.
JUN	.	.	0 <=>	.	.
AUG	.	.	1 <=>	.	.
OCT	.	.	1 <=>	.	.
DEC	.	.	0 <=>	.	.

TOTAL COLIFORM MF (CT/100ML)				DET'N LIMIT = 0	GUIDELINE = 5/100ML(A1)
FEB	BDL	BDL	.	.	.
APR	BDL	BDL	.	.	.
JUN	0	0	.	.	.
AUG	0	0	.	.	.
OCT	0	0	.	.	.
DEC	0	0	.	.	.

T COLIFORM BCKGRD MF (CT/100ML)				DET'N LIMIT = 0	GUIDELINE = N/A
FEB	BDL	100 <=>	.	.	.
APR	BDL	BDL	.	.	.
JUN	0	0	.	.	.
AUG	0	3	.	.	.
OCT	0	1	.	.	.
DEC	0	2	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

CHEMISTRY (FLD)				
FLD CHLORINE (COMB) (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A
FEB	.	.	.200	
APR	.	.	.100	
JUN	.	.	.100	
AUG	.	.	.800	
DEC	.	.	.100	
FLD CHLORINE FREE (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A
FEB	.	.	1.000	
APR	.	.	.900	
JUN	.	.	.800	
AUG	.	.	.800	
DEC	.	.	.900	
FLD CHLORINE (TOTAL) (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A
FEB	.	.	1.200	
APR	.	.	1.000	
JUN	.	.	.900	
AUG	.	.	.900	
DEC	.	.	1.000	
FLD TEMPERATURE (CO)		DET'N LIMIT = N/A		GUIDELINE = 15 (A3)
FEB	.	.	9.000	
APR	.	.	8.700	
JUN	.	.	9.000	
AUG	8.000	8.000	.	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

CHEMISTRY (LAB)			
ALKALINITY (MG/L)		DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)
FEB	237.600	231.200	232.700
APR	178.400	198.600	196.600
JUN	236.600	233.400	236.300
AUG	226.400	230.100	231.200
OCT	233.800	228.400	230.200
DEC	230.200	229.600	235.700
CALCIUM (MG/L)		DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)
FEB	90.800	86.900	85.200
APR	72.900	83.000	81.400
JUN	84.100	85.200	89.600
AUG	93.400	88.200	90.000
OCT	95.000	91.000	94.000
DEC	85.400	88.200	90.600
CYANIDE (MG/L)		DET'N LIMIT = 0.001	GUIDELINE = .2 (A1)
FEB	BDL	BDL	.003 <T
APR	.002 <T	BDL	BDL
JUN	BDL	BDL	BDL
AUG	BDL	BDL	BDL
OCT	BDL	BDL	BDL
DEC	BDL	BDL	BDL
CHLORIDE (MG/L)		DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)
FEB	25.200	7.600	18.300
APR	25.800	8.800	18.400
JUN	25.100	9.300	18.800
AUG	25.900	9.200	19.200
OCT	27.400	19.400	19.200
DEC	26.900	8.900	20.000
COLOUR (HZU)		DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)
FEB	.500 <T	1.000 <T	.500 <T
APR	BDL	1.500 <T	BDL
JUN	BDL	1.500 <T	BDL
AUG	.500 <T	1.000 <T	.500 <T
OCT	.500 <T	1.500 <T	BDL
DEC	BDL	1.500 <T	BDL
CONDUCTIVITY (UMHO/CM)		DET'N LIMIT = 1.	GUIDELINE = 400 (F2)
FEB	580	529	557
APR	586	557	570
JUN	576	535	563
AUG	565	523	551
OCT	586	529	561
DEC	587	537	567
DISS ORG CARBON (MG/L)		DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)
FEB	.100 <T	.500	.300 <T
APR	.600	1.100	.800
JUN	.700	1.200	.800
AUG	.500	.800	.700
OCT	1.700	1.900	1.900
DEC	.500	1.100	.900

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5		RAW 6		TREATED	
<hr/>					
FLUORIDE (MG/L)		DET'N LIMIT = 0.01		GUIDELINE = 2.4 (A1)	
FEB	.040 <T	.040 <T	.040 <T		
APR	.040 <T	.060	.040 <T		
JUN	.040 <T	.040 <T	.040 <T		
AUG	.040 <T	.040 <T	.040 <T		
OCT	.040 <T	.040 <T	.040 <T		
DEC	.060	.060	.060		
<hr/>					
HARDNESS (MG/L)		DET'N LIMIT = 0.5		GUIDELINE = 80-100 (A4)	
FEB	295.000	284.400	280.500		
APR	248.600	276.300	270.200		
JUN	278.000	282.000	293.000		
AUG	302.000	288.000	293.000		
OCT	306.100	296.000	304.000		
DEC	282.000	291.000	296.000		
<hr/>					
IONCAL (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A	
FEB	.433	.105	3.200		
APR	3.416	3.410	3.292		
JUN	6.243	3.065	1.224		
AUG	4.650	1.762	.716		
OCT	2.355	.425	4.643		
DEC	4.160	.927	.707		
<hr/>					
LANGELIERS INDEX (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = N/A	
FEB	1.005	.979	.991		
APR	.755	.841	.837		
JUN	1.171	1.214	1.199		
AUG	1.128	1.234	1.262		
OCT	1.147	1.204	1.218		
DEC	.844	.942	.942		
<hr/>					
MAGNESIUM (MG/L)		DET'N LIMIT = 0.10		GUIDELINE = 30 (F2)	
FEB	16.600	16.350	16.450		
APR	16.150	16.800	16.250		
JUN	16.500	16.700	16.700		
AUG	16.800	16.500	16.500		
OCT	16.750	16.700	16.850		
DEC	16.700	17.200	17.000		
<hr/>					
SODIUM (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 200 (A4)	
FEB	7.600	2.400	5.300		
APR	8.300	2.800	6.000		
JUN	8.100	3.400	6.100		
AUG	8.000	3.400	6.000		
OCT	8.700	3.600	6.600		
DEC	8.000	3.600	6.200		
<hr/>					
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = 0.05 (F2)	
FEB	BDL	BDL	BDL		
APR	BDL	BDL	BDL		
JUN	BDL	BDL	BDL		
AUG	BDL	BDL	BDL		
OCT	.002 <T	.002 <T	BDL		
DEC	BDL	BDL	BDL		
<hr/>					

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

NITRITE (MG/L)				DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)
FEB	.002 <T	.002 <T	BDL		
APR	.002 <T	.003 <T	.001 <T		
JUN	.001 <T	.001 <T	.001 <T		
AUG	.006	.005	BDL		
OCT	BDL	BDL	BDL		
DEC	BDL	.001 <T	BDL		
TOTAL NITRATES (MG/L)				DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)
FEB	2.330	2.060	2.240		
APR	2.430	2.900	2.640		
JUN	2.220	2.460	2.310		
AUG	2.610	2.570	2.510		
OCT	2.430	2.270	2.420		
DEC	2.500	2.280	2.420		
NITROGEN TOT KJELD (MG/L)				DET'N LIMIT = 0.02	GUIDELINE = N/A
FEB	.070 <T	.110	.080 <T		
APR	.040 <T	.080 <T	.050 <T		
JUN	.100	.130	.090 <T		
AUG	.040 <T	.060 <T	.050 <T		
OCT	.120	.090 <T	.070 <T		
DEC	.070 <T	.150	.120		
PH (DMNSLESS)				DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
FEB	8.140	8.140	8.160		
APR	8.110	8.090	8.100		
JUN	8.340	8.380	8.340		
AUG	8.270	8.390	8.410		
OCT	8.270	8.350	8.350		
DEC	8.020	8.100	8.080		
PHOSPHORUS FIL REACT (MG/L)				DET'N LIMIT = 0.0005	GUIDELINE = N/A
FEB	BDL	.001 <T	.001 <T		
APR	BDL	BDL	.001 <T		
JUN	.000 <T	BDL	.001 <T		
AUG	.001 <T	.002 <T	.002 <T		
OCT	.001 <T	.001 <T	.001 <T		
DEC	.000 <T	.001 <T	.001 <T		
PHOSPHORUS TOTAL (MG/L)				DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)
FEB	.004 <T	.005 <T	.003 <T		
APR	BDL	BDL	.002 <T		
JUN	BDL	BDL	BDL		
AUG	BDL	BDL	BDL		
OCT	.004 <T	.004 <T	.004 <T		
DEC	BDL	BDL	.004 <T		
SULPHATE (MG/L)				DET'N LIMIT = .200	GUIDELINE = 500 (A3)
FEB	30.170	38.880	33.380		
APR	32.870	49.700	40.460		
JUN	32.610	40.650	36.800		
AUG	31.910	36.560	34.730		
OCT	34.960	39.490	36.760		
DEC	33.350	43.960	37.720		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

TURBIDITY (FTU)		DET'N LIMIT = 0.05		GUIDELINE = 1 (A1)	
FEB	.130 <T	.260	.190 <T		
APR	.540	.250	.330		
JUN	.350	.210	.360		
AUG	.140 <T	.230 <T	.150 <T		
OCT	.240 <T	.340	.300		
DEC	.250	.250	.160 <T		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

METALS				DET'N LIMIT = 0.05	GUIDELINE = 50 (A1)
SILVER (UG/L)					
FEB	BDL	BDL	.080	<T	
APR	BDL	BDL	BDL		
JUN	BDL	BDL	BDL		
AUG	BDL	BDL	BDL		
OCT	BDL	BDL	BDL		
DEC	BDL	BDL	BDL		
ALUMINUM (UG/L)				DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)
FEB	7.200	7.800	7.800		
APR	11.000	11.000	11.000		
JUN	4.500	4.400	4.400		
AUG	11.000	8.100	7.900		
OCT	2.100	2.200	1.900		
DEC	2.600	2.300	2.500		
ARSENIC (UG/L)				DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)
FEB	.690 <T	.420 <T	.540 <T		
APR	.400 <T	.140 <T	.240 <T		
JUN	.140 <T	BDL	.120 <T		
AUG	.150 <T	BDL	BDL		
OCT	.360 <T	.290 <T	.340 <T		
DEC	.220 <T	.210 <T	.200 <T		
BARIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)
FEB	77.000	73.000	75.000		
APR	75.000	73.000	74.000		
JUN	71.000	69.000	70.000		
AUG	64.000	62.000	61.000		
OCT	76.000	71.000	74.000		
DEC	76.000	71.000	73.000		
BORON (UG/L)				DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)
FEB	41.000	36.000	41.000		
APR	29.000	34.000	35.000		
JUN	31.000	31.000	31.000		
AUG	44.000	24.000	42.000		
OCT	12.000 <T	11.000 <T	12.000 <T		
DEC	19.000 <T	17.000 <T	18.000 <T		
BERYLLIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)
FEB	.080 <T	.090 <T	BDL		
APR	.060 <T	.100 <T	.080 <T		
JUN	BDL	.060 <T	BDL		
AUG	BDL	BDL	BDL		
OCT	BDL	BDL	BDL		
DEC	BDL	BDL	BDL		
CADMIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
FEB	BDL	BDL	BDL		
APR	.080 <T	BDL	BDL		
JUN	BDL	BDL	BDL		
AUG	.250 <T	BDL	BDL		
OCT	BDL	BDL	BDL		
DEC	BDL	BDL	BDL		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5		RAW 6		TREATED	
COBALT (UG/L)				DET'N LIMIT = 0.02	GUIDELINE = N/A
FEB	BDL	BDL	BDL	BDL	
APR	.060 <T	.060 <T	.060 <T	.120 <T	
JUN	BDL	BDL	BDL	BDL	
AUG	BDL	BDL	BDL	BDL	
OCT	.200 <T	.230 <T	.230 <T	.180 <T	
DEC	.070 <T	.070 <T	.070 <T	.050 <T	
CHROMIUM (UG/L)				DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)
FEB	5.500	4.800 <T	4.800 <T	5.400	
APR	2.900 <T	3.800 <T	3.800 <T	3.700 <T	
JUN	5.800	6.300	6.300	6.200	
AUG	4.200 <T	2.400 <T	2.400 <T	3.900 <T	
OCT	1.900 <T	2.000 <T	2.000 <T	2.300 <T	
DEC	4.300 <T	4.100 <T	4.100 <T	3.900 <T	
COPPER (UG/L)				DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)
FEB	.520 <T	.600 <T	.600 <T	6.100	
APR	BDL	.670 <T	.670 <T	1.200 <T	
JUN	.530 <T	.680 <T	.680 <T	.610 <T	
AUG	5.500	.620 <T	.620 <T	.750 <T	
OCT	.550 <T	.630 <T	.630 <T	4.600 <T	
DEC	BDL	.510 <T	.510 <T	.550 <T	
MERCURY (UG/L)				DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)
FEB	BDL	BDL	BDL	.030 <T	
APR	BDL	BDL	BDL	BDL	
JUN	BDL	BDL	BDL	BDL	
AUG	BDL	BDL	BDL	BDL	
OCT	BDL	BDL	BDL	BDL	
DEC	BDL	BDL	BDL	BDL	
MANGANESE (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)
FEB	BDL	.150 <T	.150 <T	BDL	
APR	.100 <T	.390 <T	.390 <T	.210 <T	
JUN	.190 <T	.320 <T	.320 <T	.250 <T	
AUG	.190 <T	.250 <T	.250 <T	.140 <T	
OCT	.180 <T	.340 <T	.340 <T	.190 <T	
DEC	.080 <T	.270 <T	.270 <T	.180 <T	
MOLYBDENUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = N/A
FEB	.430 <T	.800	.800	.610	
APR	.310 <T	.680	.680	.480 <T	
JUN	.440 <T	.770	.770	.520	
AUG	.330 <T	.750	.750	.420 <T	
OCT	.390 <T	.830	.830	.620	
DEC	.340 <T	.790	.790	.670	
NICKEL (UG/L)				DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)
FEB	BDL	BDL	BDL	BDL	
APR	.400 <T	.540 <T	.540 <T	.740 <T	
JUN	BDL	BDL	BDL	BDL	
AUG	.320 <T	BDL	BDL	BDL	
OCT	BDL	BDL	BDL	BDL	
DEC	BDL	BDL	BDL	BDL	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5		RAW 6		TREATED	
LEAD (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)
FEB	BDL	BDL	.170 <T		
APR	BDL	.070 <T	BDL		
JUN	BDL	BDL	BDL		
AUG	.270 <T	BDL	BDL		
OCT	BDL	.060 <T	.170 <T		
DEC	BDL	BDL	BDL		
ANTIMONY (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
FEB	.400 <T	.380 <T	.340 <T		
APR	.350 <T	.300 <T	.230 <T		
JUN	.350 <T	.330 <T	.280 <T		
AUG	.120 <T	.410 <T	.250 <T		
OCT	.540	.430 <T	.220 <T		
DEC	.460 <T	.360 <T	.310 <T		
SELENIUM (UG/L)				DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)
FEB	BDL	BDL	BDL		
APR	BDL	BDL	BDL		
JUN	BDL	BDL	2.200 <T		
AUG	BDL	BDL	BDL		
OCT	BDL	BDL	BDL		
DEC	BDL	BDL	BDL		
STRONTIUM (UG/L)				DET'N LIMIT = 0.10	GUIDELINE = N/A
FEB	190.000	170.000	180.000		
APR	190.000	180.000	190.000		
JUN	190.000	170.000	180.000		
AUG	180.000	160.000	150.000		
OCT	190.000	180.000	190.000		
DEC	190.000	170.000	180.000		
TITANIUM (UG/L)				DET'N LIMIT = 0.50	GUIDELINE = N/A
FEB	14.000	14.000	14.000		
APR	16.000	15.000	16.000		
JUN	29.000	29.000	28.000		
AUG	22.000	21.000	20.000		
OCT	12.000	12.000	12.000		
DEC	13.000	12.000	12.000		
URANIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)
FEB	2.700	2.500	2.800		
APR	2.800	2.800	2.900		
JUN	2.500	2.700	2.800		
AUG	2.500	2.400	2.400		
OCT	2.800	2.800	2.800		
DEC	2.800	2.700	2.700		
VANADIUM (UG/L)				DET'N LIMIT = 0.05	GUIDELINE = N/A
FEB	.470 <T	.230 <T	.390 <T		
APR	.060 <T	.100 <T	.100 <T		
JUN	.130 <T	.130 <T	.130 <T		
AUG	.080 <T	.090 <T	.110 <T		
OCT	.060 <T	BDL	BDL		
DEC	.170 <T	.090 <T	.130 <T		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

	RAW 5	RAW 6	TREATED	
ZINC (UG/L)				GUIDELINE = 5000 (A3)
				DET'N LIMIT = 0.20
FEB	1.300 <T	1.300 <T	2.800	
APR	1.900 <T	1.700 <T	2.600	
JUN	2.500	2.300	2.100	
AUG	4.000	1.400 <T	1.500 <T	
OCT	1.800 <T	2.200	3.100	
DEC	1.400 <T	1.300 <T	1.100 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

PHENOLICS			
PHENOLICS (UG/L)	()	DET'N LIMIT = .200	GUIDELINE = 2 (A4)
FEB	.600 <T	.400 <T	.600 <T
APR	.400 <T	.400 <T	BDL
JUN	BDL	BDL	BDL
AUG	BDL	BDL	BDL
OCT	.600 <T	BDL	BDL
DEC	.800 <T	.800 <T	.600 <T

TABLE 5
 DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

SPECIFIC PESTICIDES			
PARATHION (NG/L)			
JUN	BDL	BDL	BDL
OCT	BDL	130.000 <T	60.000 <T

DET'N LIMIT = 20.

GUIDELINE = 50000 (A1)

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5

RAW 6

TREATED

VOLATILES				GUIDELINE = 5 (A1)
BENZENE (UG/L)			DET'N LIMIT = 0.05	
FEB	!U	BDL	!U	
APR	BDL	.050 <T	BDL	
JUN	!RE	BDL	BDL	
AUG	BDL	BDL	BDL	
OCT	BDL	BDL	BDL	
DEC	BDL	BDL	BDL	
ETHYLBENZENE (UG/L)				GUIDELINE = 2.4 (A3)
			DET'N LIMIT = 0.05	
FEB	!U	BDL	!U	
APR	BDL	BDL	BDL	
JUN	!RE	.050 <T	.100 <T	
AUG	.050 <T	BDL	BDL	
OCT	.050 <T	.100 <T	BDL	
DEC	BDL	.050 <T	BDL	
STYRENE (UG/L)				GUIDELINE = 100 (D1)
			DET'N LIMIT = 0.05	
FEB	!U	.100 <T	!U	
APR	BDL	BDL	BDL	
JUN	!RE	.100 <T	BDL	
AUG	.150 <T	.050 <T	BDL	
OCT	.100 <T	.150 <T	BDL	
DEC	.100 <T	.100 <T	BDL	
CHLOROFORM (UG/L)				GUIDELINE = 350 (A1+)
			DET'N LIMIT = 0.10	
FEB	!U	BDL	!U	
APR	BDL	BDL	9.900	
JUN	!RE	BDL	3.700	
AUG	BDL	BDL	4.700	
OCT	BDL	BDL	4.400	
DEC	BDL	BDL	6.000	
DICHLOROBROMOMETHANE (UG/L)				GUIDELINE = 350 (A1+)
			DET'N LIMIT = 0.05	
FEB	!U	BDL	!U	
APR	BDL	BDL	7.500	
JUN	!RE	BDL	3.850	
AUG	BDL	BDL	6.200	
OCT	BDL	BDL	5.600	
DEC	BDL	BDL	6.900	
CHLORODIBROMOMETHANE (UG/L)				GUIDELINE = 350 (A1+)
			DET'N LIMIT = 0.10	
FEB	!U	BDL	!U	
APR	BDL	BDL	4.500	
JUN	!RE	BDL	3.400	
AUG	BDL	BDL	6.300	
OCT	BDL	BDL	5.400	
DEC	BDL	BDL	5.400	
BROMOFORM (UG/L)				GUIDELINE = 350 (A1+)
			DET'N LIMIT = 0.20	
FEB	!U	BDL	!U	
APR	BDL	BDL	.400 <T	
JUN	!RE	BDL	.400 <T	
AUG	BDL	BDL	1.400 <T	
OCT	BDL	BDL	1.200 <T	
DEC	BDL	BDL	1.000 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM STOUFFVILLE WELL SUPPLY 1990

WELL SUPPLY

DISTRIBUTION SYSTEM

RAW 5		RAW 6	TREATED	
TOTAL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)
FEB	IU	BDL	IU	
APR	BDL	BDL	22.300	
JUN	I RE	BDL	11.450	
AUG	BDL	BDL	18.650	
OCT	BDL	BDL	16.600	
DEC	BDL	BDL	19.300	

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
2,4-DICHLOROPHENOXYBUTYRIC ACID (2,4-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHYLENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

- i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;
- ii/ the water being sampled is not being modified by the sampling system;
- iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and
- iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P)

VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION: NAME: BENZENE

CAS#: 71-43-2

MOLECULAR FORMULAE: C₆H₆

DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L

SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27).
CYCLOHEXATRIENE (41).

CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).

PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41).
THRESHOLD ODOUR: 0.5 - 10 PPM IN WATER
THRESHOLD TASTE: 0.5 mg/L IN WATER (39).

ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).

SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:

MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M³/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)
SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA
EPA PRIORITY POLLUTANT.

NOTES:

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	<ul style="list-style-type: none">-500 mL plastic bottle (PET 500)-rinse bottle and cap with sample water three times-fill to 2 cm from top
Bacteriological	<ul style="list-style-type: none">-220 mL plastic bottle with white seal on cap-do <u>not</u> rinse bottle, preservative has been added-avoid touching bottle neck or inside of cap-fill to top of red label as marked
Metals	<ul style="list-style-type: none">-500 mL plastic bottle (PET 500)-rinse bottle and cap three times-fill to 2 cm from top-add 10 drops nitric acid (HNO_3) (Caution: HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	<ul style="list-style-type: none">-45 mL glass vial with septum (teflon side must be in contact with sample)-do <u>not</u> rinse bottle-fill bottle completely without bubbles
Organics (OWOC), (OWTRI), (OAPAHX)	<ul style="list-style-type: none">-1 L amber glass bottle per scan-do <u>not</u> rinse bottle-fill to 2 cm from top-when 'special pesticides' are requested three extra bottles must be filled
Cyanide	<ul style="list-style-type: none">-500 mL plastic bottle (PET 500)-rinse bottle and cap three times-fill to 2 cm from top

-add 10 drops sodium hydroxide (NaOH)
(Caution: NaOH is corrosive)

Mercury

-250 mL glass bottle
-rinse bottle and cap three times
-fill to top of label
-add 20 drops each nitric acid (HNO_3)
and potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$)
(Caution: HNO_3 & $\text{K}_2\text{Cr}_2\text{O}_7$ are corrosive)

Phenols

-250 mL glass bottle
-do not rinse bottle, preservative
has been added
-fill to top of label

Radionuclides
(as scheduled)

-4 L plastic jug
-do not rinse, carrier added
-fill to 5 cm from top

Organic Characterization (GC/MS - once per year) -1 L amber glass bottle; instructions
as per organic
-250 mL glass bottle
-do not rinse bottle
-fill completely without bubbles

Steps:

1. Let sampling water tap run for an adequate time to clear the sample line.
2. Record time of day on submission sheet.
3. Record temperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry

-500 mL plastic bottle (PET 500)
-rinse bottle and cap with sample

water three times
-fill to 2 cm from top

Metals

-500 mL plastic bottle (PET 500)
-rinse bottle and cap three times
-fill to 2 cm from top
-add 10 drops nitric acid (HNO_3)
(Caution: HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry

-500 mL plastic bottle (PET 500)
-rinse bottle and cap with sample water three times
-fill to 2 cm from top

Bacteriological

-250 mL plastic bottle with white seal on cap
-do not rinse bottle, preservative has been added
-avoid touching bottle neck or inside of cap
-fill to top of red label as marked

Metals

-500 mL plastic bottle (PET 500)
-rinse bottle and cap three times
-fill to 2 cm from top

-add 10 drops nitric acid HNO_3
(Caution: HNO_3 is corrosive)

Volatiles (duplicate)
(OPOPUP)

-45 mL glass vial with septum
(teflon side must be in contact
with sample)
-do not rinse bottle, preservative
has been added
-fill bottle completely without
bubbles

Organics
(OWOC) (OAPAHX)

-1 L amber glass bottle per scan
-do not rinse bottle
-fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.
2. Let cold water flow for five minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total),
turbidity and pH on submission sheet.



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